

Remarks

Applicants appreciate the Examiner's determination that claims 2-4 would be allowable pending withdrawal of the rejection under 35 U.S.C. § 112, second paragraph.

Claim 17 is indicated as withdrawn. Claim 17 recites the same precipitation method as claim 2. As noted above, claim 2 is indicated as allowable pending withdrawal of the rejection under 35 U.S.C. § 112, second paragraph. Claim 17 also appears to have been examined (see the discussion of the rejection under 35 U.S.C. § 112, second paragraph, below). Thus, even though technically withdrawn, claim 17 also should be allowable pending withdrawal of the rejection under 35 U.S.C. § 112, second paragraph..

The Amendments to the Claims

Various amendments to the claims have been made to address the rejections under 35 U.S.C. § 112, second paragraph, as suggested in the Office Action. In addition, the following amendments have been made.

Claim 1 has been amended to recite that the starting material is reacted with a silica sol "at a reaction pH in the range between 6 and 11 and at a reaction temperature in the range between ambient temperature and 100°C." Support for the recited reaction pH is found at page 13, first full paragraph. The recited temperature range is supported by originally filed claim 7 and at page 8, lines 9-12.

Claims 2 and 17 have been amended to recite a pH below 1.7. This pH is disclosed at page 11, first full paragraph.

Claim 9 has been amended to recite a “homogeneous” phase. This amendment is supported at page 8, first full paragraph.

Claims 8-10 have been amended to recite “a composition of matter.” This amendment merely reflects the statutory class into which the subject matter of claims 8-10 falls.

New dependent claims 18-24 have been added. These claims are supported by originally filed claims 11-16.

The amendments add no new matter.

Objection to the Abstract

The abstract has been amended to delete both occurrences of the word “said.” Applicants respectfully request withdrawal of the objection.

Objection to Claim 3

Claim 3 is objected to because it recites “alkaline metals” instead of “alkali metals.” While these designations are interchangeable, claim 3 has been changed as suggested in the Office Action. Applicants respectfully request withdrawal of the objection.

The Rejection of Claims 1-10 Under 35 U.S.C. § 112, second paragraph

Claims 1-10 stand rejected under 35 U.S.C. § 112, second paragraph, as indefinite.

Applicants respectfully traverse the rejection.

The issues raised in the Office Action have been addressed as follows.

- Claim 1: The phrase “the coagulation of silica particles” has been deleted.
- Claim 2: The phrase “the value at which precipitation of titanium hydroxide occurs” has been deleted.
- Claims 2 and 17: Antecedent basis has been provided for “said second alkaline agent.”
- Claims 3 and 5: The Markush groups of claims 3 and 5 have been corrected as suggested in the Office Action.
- Claim 4: Claim 4 has been amended as suggested in the Office Action to recite “the alkaline agent used in step b).”
- Claim 9: The phrase “the same position at different point” has been deleted.
- Claim 13: Claim 13 has been canceled.

Applicants respectfully request withdrawal of the rejection.

The Rejection of Claims 1 and 5-7 Under 35 U.S.C. § 102(b)

Claims 1 and 5-7 stand rejected under 35 U.S.C. § 102(b) as anticipated by Land, U.S. Patent 3,841,879 ("Land"). Applicants respectfully traverse the rejection.

To reject a claim as anticipated, each and every element as set forth in the claim must be either expressly or inherently described in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d (BNA) 1051, 1053 (Fed. Cir. 1987). Land does not meet the standard of a reference under 35 U.S.C. § 102(b) because it does not disclose each element recited in independent claim 1.

Independent claim 1 is directed to a method for preparing thermally stable, silicon-containing titanium dioxide. The method comprises two steps: a) providing a starting material that is titanium hydroxide or titanium dioxide; and b) reacting said starting material with a silica sol at a reaction pH in the range between 6 and 11 and at a reaction temperature in the range between ambient temperature and 100°C to obtain silicon-containing titanium dioxide. The Office Action asserts that Land discloses a method for making silica-containing titanium dioxide comprising providing titanium dioxide, reacting it with silica sol under conditions to prevent agglomeration, and drying. Office Action at page 5. This assertion is incorrect.

The teachings of Land do not pertain to methods for preparing thermally stable, silicon-containing titanium dioxide at all. Land is directed to a rupturable container related to photographic technology. The rupturable container contains a photosensitive element, an example of which is taught in the example at col. 6, line 65, to col. 10, line 69. Titanium dioxide and colloidal silica are used in an aqueous alkaline processing composition of the photosensitive element (see col. 8, lines 20-40). Land teaches that "[i]n preparing the above processing composition, the polymer and the titanium dioxide were blended dry and then added to a solution

containing all of the other reagents except the colloidal silica which was added last.” Col. 9, line 70, to col. 10, line 66.

There is no indication that a silicon-containing titanium dioxide might be formed in this aqueous alkaline processing composition. There is no teaching in any of the cited passages of Land, or indeed in any portion of Land, of reacting titanium oxide and silica at a pH range between 6 and 11 or at a temperature in the range between ambient temperature and 100°C, as recited in claim 1. In fact, the passage consisting of lines 1-10 at column 6, cited as disclosing “providing titanium oxide and reacting with silica sol,” is entirely about colloidal silica and contains neither the word “reaction” nor the word “titanium.”

Land belongs to entirely different field than the invention of this application. As such, no portions of Land’s specification teach anything close to the invention to which independent claim 1 is directed. Thus, Land anticipates neither independent claim 1 nor dependent claims 5-7.

Applicants respectfully request withdrawal of the rejection.

The Rejection of Claims 1 and 5-7 Under 35 U.S.C. § 102(b)

Claims 1 and 5-7 stand rejected under 35 U.S.C. § 102(b) as anticipated by Nakahara *et al.*, U.S. Patent 5,139,908 ("Nakahara"). Applicants respectfully traverse the rejection.

Nakahara does not disclose each element of independent claim 1 and therefore does not anticipate claim 1 or dependent claims 5-7.

Independent claim 1 is directed to a method for preparing thermally stable, silicon-containing titanium dioxide. The method involves a) providing a starting material that is titanium hydroxide or titanium dioxide; and b) reacting said starting material with a silica sol at a reaction pH in the range between 6 and 11 and at a reaction temperature in the range between ambient temperature and 100°C. Dependent claim 5 recites that the reaction pH is between 8 and 10. Dependent claim 6 recites various physical forms of the titanium hydroxide or titanium dioxide starting material. Dependent claim 7 recites that the reaction temperature is in the range of 70-100°C.

Nakahara's method does not include a step of reacting titanium hydroxide or titanium dioxide with a silica sol, as recited in claim 1. Nakahara's method is totally different from the method of this application. Nakahara discloses a method for producing inorganic oxide particles. The method involves adding a hydrolysable and condensable organic metal compound to a suspension of inorganic oxide seed particles in a water-containing alcohol solution, thereby causing growth of the seed particles (see abstract and column 2, lines 41-48). The inorganic oxide seed particles can be titanium dioxide or various other metal oxides (column 3, lines 51-53). The goal of the method is to obtain particles of a controllable diameter (see column 2, lines 41-43, and Table 1).

The Office Action cites Nakahara's abstract, column 4, lines 11-15, and Example 8 as teaching the invention of claim 1. The abstract does not mention any silica-titanica particles at all. The Office Action cites column 4, lines 11-15, as disclosing reacting titanium with a silica sol; however, this passage describes the formation of silica particles from water glass, without any mention of titanium. Example 8 teaches the preparation of titania-silica spherical particles, comprising titanium and silicon in the form of organic metals, namely tetraisopropoxytitanate and tetramethoxysilane. In contrast, the method of claims 1 and 5-7 employs inorganic forms of the two metals. In addition, Nakahara's reaction temperature (197°C) is different from the reaction temperature recited in amended claim 1 (between ambient temperature and 100°C).

Nakahara not only teaches an entirely different method of making inorganic oxide particles, but the particles themselves are different. Nakahara's particles contain approximately the same amounts of Ti and Si, while the particles formed by the method of claim 1 contain about 18% SiO₂. See the specification at page 15, second and third paragraphs. Moreover, it is apparent from Table 1 of Nakahara that the disclosed "inorganic oxide particles" contain alkylene glycol bonded to the inorganic phase, showing that Nakahara's particles are not inorganic at all. Nor can these particles be stable at high temperatures.

Nakahara does not disclose each element of independent claim 1 or dependent claims 5-7. Thus, Nakahara does not anticipate the subject matter of these claims.

Applicants respectfully request withdrawal of the rejection.

The Rejections of Claims 8-10 Under 35 U.S.C. § 102(b) or 35 U.S.C. § 103(a)

Claims 8-10 stand rejected under either 35 U.S.C. § 102(b) as anticipated or under 35 U.S.C. § 103(a) as obvious over both Land and Nakahara. Applicants respectfully traverse the rejections.

Claims 8-10 are directed to compositions of matter comprising thermally stable titanium dioxide. Independent claim 8 recites that the thermally stable titanium dioxide is made by the method of claim 1 and contains not more than 18% silicon, calculated in terms of SiO₂ on dry basis. Dependent claim 9 recites that the thermally stable titanium dioxide is a single homogeneous phase. Dependent claim 10 recites that the thermally stable titanium dioxide has a specific surface area greater than 300 m²/g, and a specific pore volume which is of at least 0.30 cc/g for pores having a diameter less than 100 nm. Neither Land nor Nakahara either anticipates nor renders *prima facie* obvious such compositions.

35 U.S.C. § 102(b)

To reject a claim as anticipated, each and every element as set forth in the claim must be either expressly or inherently described in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d (BNA) 1051, 1053 (Fed. Cir. 1987). Neither Land nor Nakahara meets the standard of a reference under 35 U.S.C. § 102(b) because neither document discloses each element recited in independent claim 8.

The Office Action contends that Land teaches a method for making silica-containing titanium dioxide. Office Action at page 6, point 11. This is not true, as discussed above in connection with the rejection of claims 1 and 5-7 over Land; that argument is incorporated here. As Applicants' argument establishes, Land teaches neither a method for making silica-containing

titanium dioxide nor the compositions containing the silica-containing titanium dioxide. Thus, Land does not anticipate the invention of claims 8-10.

The Office Action also contends that Nakahara discloses a method for production of silica-titania particles. Office Action at page 7, point 12. Again, as discussed above in connection with the rejection of claims 1 and 5-7 over Nakahara, not only does Nakahara teach an entirely different method of making inorganic oxide particles, but the particles themselves are different. Those arguments are incorporated here. Thus, Nakahara does not anticipate the invention of claims 8-10.

35 U.S.C. § 103(a)

The U.S. Patent and Trademark Office bears the initial burden of establishing a *prima facie* case of obviousness. The *prima facie* case requires three showings:

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

Manual of Patent Examining Procedure, 8th ed., § 2142. In the present application, a *prima facie* case that claims 8-10 are obvious has not been made because neither Land nor Nakahara teaches or suggests the silicon-containing titanium dioxide recited in claims 8-10.

As indicated by the arguments above, the ordinary artisan would have understood that the method disclosed in the present application is different from the methods disclosed in the two cited documents. The ordinary artisan also would have understood that the products provided by the methods of Land and Nakahara are totally different from the silicon-containing titanium dioxide recited in claims 8-10. The difference relates both to the structure of the products and to

their intended use. No routine modification of the photographic products of Land, or of the alkylene-bonded particles of Nakahara, would provide the highly stable, inorganic silicon-containing titanium oxide of claims 8-10, which demonstrates an unexpectedly high stability at high temperatures and keeps a surprisingly high specific surface area. Thus, neither Land nor Nakahara teaches or suggests the subject matter of claims 8-10.

Applicants respectfully request withdrawal of the rejections.

U.S. Patent 5,030,286

The Office Action cites U.S. Patent 5,030,286 as pertinent. U.S. Patent 5,030,286 claims a slurry of silica having particle sizes between 0.3 to 3 microns. This slurry may comprise a dispersing amount of other admixtures, typically used as fillers, selected from the group consisting of seven components and unlimited number of their mixtures, one of the components being titanium oxide. U.S. Patent 5,030,286 teaches neither a stable silicon-containing titanium oxide, nor a process for process for preparing one.

Respectfully submitted,
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